BAYOU PLAQUEMINE BRULE TMDL FOR FECAL COLIFORM

SUBSEGMENT 050201

US EPA Region 6

With cooperation from the
Louisiana Department of Environmental Quality
Office of Environmental Assessment
Environmental Technology Division

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody. A TMDL has been developed for fecal coliform bacteria for the Bayou Plaquemine Brule (subsegment 050201).

Bayou Plaquemine Brule subsegment 050201 was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for primary contact recreation (swimming). Louisiana's water quality standard for protection of the primary contact recreation use reads as follows:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 400/100mL. These primary contact recreation criteria shall apply only during the defined recreational period of May 1 through October 31. During the non-recreational period of November 1 through April 30, the criteria for secondary contact recreation shall apply."

The standard for secondary contact recreation reads similarly:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 2,000/100 mL."

Fecal coliform bacteria are monitored as the indicator for potential human health threats resulting from swimming. Fecal coliform data collected on Bayou Plaquemine Brule near Estherwood was used in development of this TMDL.

For the purpose of TMDL development, the criteria of 200/100mL and 1,000/100mL were applied. TMDL fecal coliform loading curves for the recreational period (May 1 – October 31) and the non-recreational period (November1 – April 30) have been generated as Figures 1 and 2. These TMDL loading curves are developed using Equation 1, substituting the criteria, 200 and 1000 cfu/100 ml, for FC concentrations and varying flows. The attempt here is to show that while a TMDL may be expressed as a single point it can also be thought of as a continuum of points representing the criterion value and various flow values. An 83% reduction in fecal coliform loading during the May – October season will be needed to meet the present standard for primary contact recreation in the summer season. A 73% reduction in fecal coliform loading during the November – April season will be needed to meet the standard for secondary contact recreation.

1. Introduction

Bayou Plaquemine Brule, Segment 050201 of the Mermentau Basin was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for primary contact recreation (swimming). On the 1998 List, these segments of the Vermilion River are ranked as a high priority (1) for TMDL development. A TMDL for fecal coliform bacteria was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources of the pollutant of concern, and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and future growth.

2. Study Area Description

2.1 Bayou Plaquemine Brule Watershed, Segment 050201

This area is typical of the basin with its low relief which is an ideal condition for agricultural use as documented in Table 1. Segment 0502 is comprised of Bayou Plaquemine Brule as the main stem with several tributaries. These tributaries include Hazelwood Gully, Coles Gully, Long Point Gully, Bayou Wikoff, Bayou Blanc and North Coulee Trief.

Average annual precipitation in the segment, based on the nearest Louisiana Climatic Station in Crowley is 56.91 inches based on a 30 year record (LSU, 1999). Land use in the Mermentau River Basin is largely agricultural, the primary crops being rice and soybeans. Originally, this area was covered by tall prairie grasses, among which there were scattered clumps of trees (USDA, 1962). In the segment under study, agricultural uses account for 89% of the total segment area. Land uses in Segment 0502 are shown in Table 1 (LDEQ, 1993).

Table 1. Land uses in Segment 0502 of the Mermentau River Basin

LAND USE TYPE	NUMBER OF ACRES	% OF TOTAL AREA
Urban	12,259	3.5
Extractive	1,838	0.5
Agricultural	316,160	89.0
Forest Land	13,475	3.8
Water	536	0.2
Wetland	10,450	2.9
Barren Land	484	0.1
TOTAL AREA	355,202	100

2.2 Water Quality Standards

The designated uses for Bayou Plaquemine Brule include both primary contact recreation and secondary contact recreation. Fecal coliform bacteria serve as the indicator used for the water quality criteria and for assessment of use support. Louisiana's water quality standard for protection of the primary contact recreation use reads as follows:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 400/100mL. These primary contact recreation criteria shall apply only during the defined recreational period of May 1 through October 31. During the non-recreational period of November 1 through April 30, the criteria for secondary contact recreation shall apply."

The standard for secondary contact recreation reads similarly:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 2,000/100 mL."

2.3 Identification of Sources

The sources identified in the *1998 Louisiana Water Quality Inventory* as affecting the water quality of Bayou Plaquemine Brule are irrigated and non-irrigated crop production and urban runoff/storm sewers (LDEQ, 1998). Agriculture in the watershed includes row crops, such as sugar cane, corn, sweet potatoes, and soybeans, and some ranching. Other sources of fecal coliform bacteria are wild and domesticated animals.

2.3.1 Point Sources

There are known flows for 17 facilities discharging sanitary wastewater into Bayou Plaquemine Brule and its tributaries. The combined flow of all these discharges is 5,277,000 gallons per day (see Appendix B).

2.3.2 Nonpoint Sources

The predominant land uses in Bayou Plaquemine Brule River watershed are agriculture and urban land use. It is presently unknown to what relative extent these sources contribute to fecal coliform loads. In addition to some row crops, the watershed is predominated by rice fields. Rice fields are a source of fecal coliform bacteria because they are utilized by waterfowl during the fall and winter. There are also numerous rural residences where other domesticated animals may be found. These rural residences may also contribute to the fecal coliform load if they have septic tanks or septic fields for their wastewater treatment.

3. TMDL Load Calculations

3.1 Current Load Evaluation

Fecal coliform loads have been calculated using the instream bacterial counts and the flow of the stream. The following equation can be used to calculate fecal coliform loads.

Equation 1. C x 1000mL/ L x 1 L/0.264 gallons x Q in gallons/day = cfu/day

Where: C = colony forming units/100mL
Q = stream flow in gallons/day

A traditional expression of the FC loading may be developed by setting one critical or representative flow and concentration, and calculating the fecal coliform load using Equation 1. The difficulty with this approach is in the determination of the appropriate flow or concentration value to use. LDEQ has monthly monitoring data for two locations in Bayou Plaquemine Brule: near Estherwood, and at Refinery. For the purpose of calculating the current fecal coliform load in Bayou Plaquemine Brule, the data from the Estherwood site was used because it contained 5 years worth of data. For the purpose of calculating current loading on this waterbody the average fecal coliform concentration for the November – April and the May-October seasons were calculated. In Bayou Plaquemine Brule at Estherwood, the monthly fecal coliform counts ranged from 7 /100mL to > 16,000 /100mL over a 5-year period (June, 1994-May, 1998). The average fecal coliform count for the May – October season is 1162 cfu/100ml. The average fecal coliform count for the November – April season is 3719 cfu /100ml (see Appendix A). In addition, the average flow for Bayou Plaquemine Brule at Estherwood (327.4 mi^2) for the November – April season is 878 ft^3/sec and for the May – October season is 504 ft^3/sec (see Appendix C). Using these values and Equation 1 it is estimated that the current loading for the November – April season is 7.98 E13 cfu/day and the current loading for the May – October season is 1.43 E13 cfu/day (see Appendix A).

3.2 TMDL

Point sources usually have a defined critical receiving stream low flow such as the 7Q10 at which the criterion must be met. For nonpoint sources it is recognized that there may be no single critical flow condition. To address this condition, TMDL fecal coliform loading curves for the recreational period (May 1 – October 31) and the non-recreational period (November – April) have been generated as Figures 1 and 2. These loading curves were developed using Equation 1, substituting the criteria, 200 cfu/100 ml, and 1000 cfu/100ml for FC concentrations and varying flows. The attempt here is to show that while a TMDL may be expressed as a single point it can also be thought of as a continuum of points representing the criterion value and various flow values. These curves are not stream dependent but are dependent upon the designated stream criterion. Therefore, they may be applied to any stream with a like FC criterion. These curves represent the TMDL loading allocation for FC.

Figure 1. TMDL Fecal Coliform Loading Curve for the May – October season.

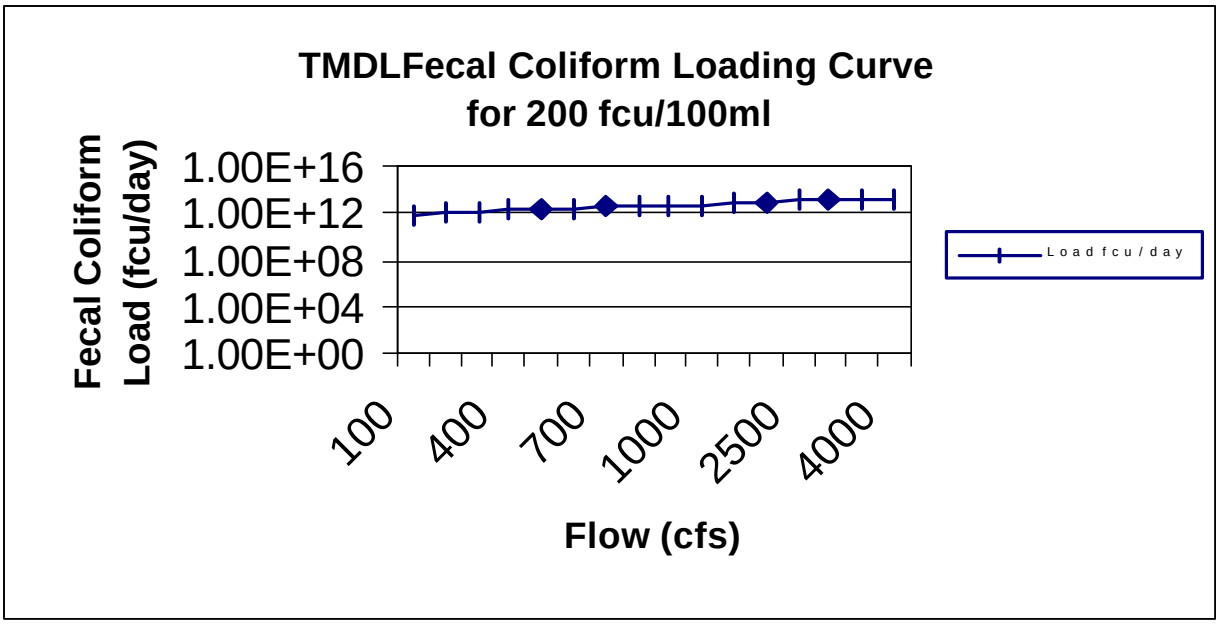
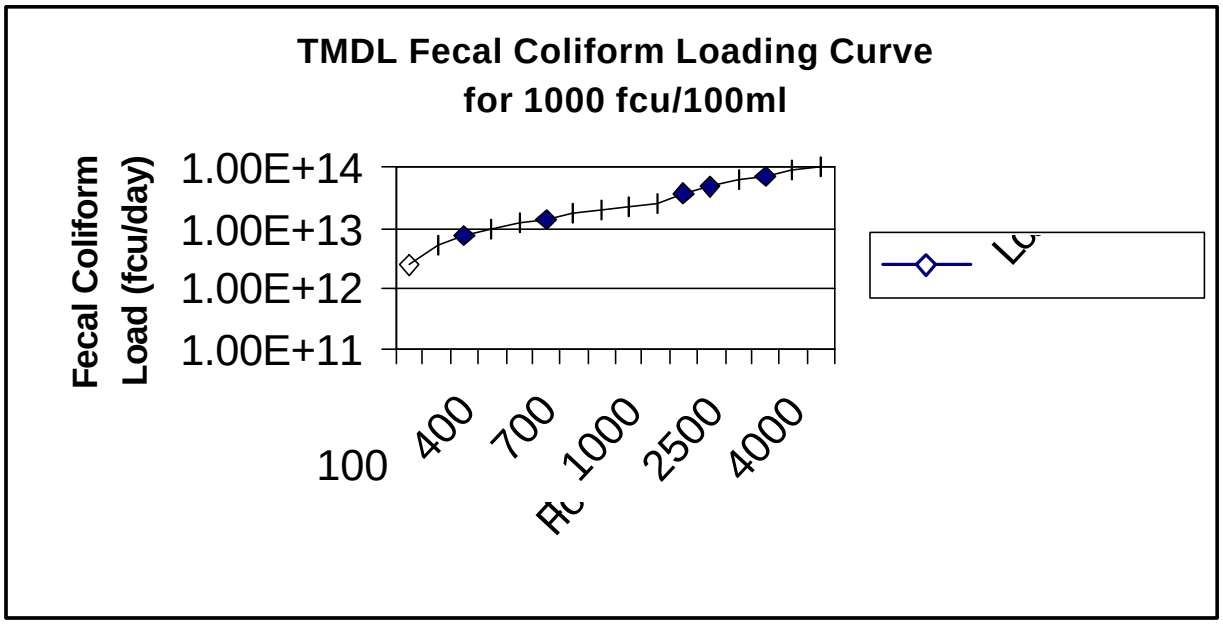


Figure 2. TMDL Fecal Coliform Loading Curve for the November - April season.



Utilizing Figures 1 and 2 one can select a stream flow and can quickly determine the TMDL FC loading value. The line formed by these series of points may be thought of as a boundary. At any given flow the loading may be below the line, within the boundary, or above the line. FC load values falling above the line represent disproportionately high values relative to the standard. FC load values falling below the line represent low loads relative to the standard. To develop load reductions one simply needs to determine the appropriate flow value (x-axis) and see where it intersects the load allocation line.

The load reduction needed to meet the water quality standard for primary contact recreation in Bayou Plaquemine Brule during the May – October season at 504 cfs is 1.18 E13 cfu/day (83% reduction)[1]. This was obtained by calculating the allowable TMDL at 504 cfs for the 200 cfu/100ml criterion (2.46 E12 cfu/day) and subtracting this load from the observed load (1.43 E13 cfu/day, see Appendix A).

Current Load - TMDL = Load Reduction

1.43 E13 cfu/day – 2.46 E12 cfu/day = 1.18 E13 cfu/day

The load reduction needed to meet the water quality standard for secondary contact recreation in the Bayou Plaquemine Brule during the November – April season at 878 cfs is 5.83 E13 cfu/day (73% reduction) [1]. This was obtained by calculating the allowable TMDL at 878 cfs for the 1000 cfu/100ml criterion (2.15 E13 cfu/day) and subtracting this load from the observed load (7.98 E13 cfu/day, see Appendix A).

Current Load - TMDL = Load Reduction

7.98 E13 cfu/day – 2.15 E13 cfu/day = 5.83 E13 cfu/day

3.3 Wasteload Allocation (WLA)

The Louisiana Water Quality Regulations require point source discharges of treated sanitary wastewater to maintain a fecal coliform count of 200cfu/100ml in their effluent, i.e., they must meet the standard at end-of-pipe. Therefore, there will be no change in the permit requirements based upon a wasteload allocation resulting from this TMDL.

Equation 1 can be used to calculate the total point source load (wasteload allocation) utilizing a fecal coliform count of 200cfu/100ml and the total volume of all the wastewater dischargers (5,277,000 gallons/day).

200 cfu/100mL * 1000mL/L * 1 L/0.264 gallons * Q gallons/day = WLA

Where Q = Total volume of sanitary wastewater discharges into Bayou Plaquemine Brule

[1] Expression of the load reduction percentage was adjusted since publication of the draft TMDL based on public comment; see EPA's response-to-comments at http://www.epa.gov/earth1r6/6wq/tmdl.htm for further explanation.

WLA for all dischargers = 4.00 E10 cfu/day

3.4 Load Allocation (LA)

The load allocation for each season for a given flow can be calculated using Equation 1 and the following relationship:

(TMDL@ given flow and criterion) - (WLA) = LA

LA for May – October season at an instream flow of 504 cfs = 2.42 E12 cfu/day

2.46 E12 cfu/day (TMDL@ 504 cfs) – 4.00 E10 cfu/day (WLA) = 2.42 E12 cfu/day

LA for November – April season at an instream flow of 878 cfs = 1.508 E14 cfu/day

2.15 E13 cfu/day (TMDL@ 878 cfs) – 4.00 E10 cfu/day (WLA) = 2.146 E13 cfu/day

3.5 Seasonal Variability

Louisiana has established a seasonal water quality standard for bacteria based upon definition of a summer swimming season and winter secondary contact only. The TMDL fecal coliform loading curves have been developed for both seasons at all flows.

3.6 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit. In this TMDL for fecal coliform, conservative assumptions have been used and therefore, the margin of safety is implicit. These conservative assumptions are:

- Using average seasonal flows to calculate current loading to obtain load reduction.
- Treating fecal coliform bacteria as a conservative pollutant, that is, a pollutant that does not degrade in the environment (bacteria do die off in the environment)
- Using the more conservative 200 cfu/100mL standard rather than 400 cfu/100mL for the summer primary contact recreational season and 1,000 cfu/100mL rather than 2,000 cfu/100mL for the winter season.
- Using the design flow of the point source dischargers rather than actual average flow rates, which are typically much lower

4. Other Relevant Information

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Mermentau River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

5. Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

REFERENCES

LDEQ, 1993. *State of Louisiana Water Quality ManagementPlan, Volume 6, Part A: Nonpoint Source Pollution Assessment Report*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La.

LDEQ, 1998. *State of Louisiana Water Quality ManagementPlan, Volume 5, Part B: Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La.

Louisiana State University. 1999. State Office of Climatology.

U.S. Department of Agriculture, Soil Conservation Service, *Soil Survey Acadia Parish Louisiana*, Series 1959, No.15, September 1962.

APPENDIX A Fecal Coliform data and loading calculations for each season.

Bayou Plaquemine Brule at Estherwood

November - April		FECAL		May - October		FECAL
		COLIFORM				COLIFORM
DATE	TIME	MPN/100ML		DATE	TIME	MPN/100ML
------	----	---------		------	----	---------
04/13/1998	1013	30		05/11/1998	1002	80
03/09/1998	930	1300		10/13/1997	1011	50
02/09/1998	1003	500		09/08/1997	1004	50
01/12/1998	1008	500		08/11/1997	1106	30
12/08/1997	921	1300		07/14/1997	1142	1300
11/17/1997	956	300		06/09/1997	1000	5000
04/14/1997	909	9000		05/12/1997	1029	80
03/10/1997	1025	500		10/14/1996	818	30
02/17/1997	920	3000		09/09/1996	815	50
01/07/1997	1037	5000		08/12/1996	842	500
12/10/1996	920	170		07/09/1996	830	11
11/18/1996	843	16000		06/10/1996	815	7
04/08/1996	900	16000		05/13/1996	828	50
03/11/1996	835	800		10/09/1995	810	80
02/12/1996	830	2400		09/12/1995	815	8
01/08/1996	820	9000		08/14/1995	820	9000
12/11/1995	840	170		07/11/1995	805	300
11/13/1995	810	500		06/12/1995	832	50
04/03/1995	815	900		05/09/1995	815	3000
03/14/1995	807	16000		10/10/1994	1042	40
02/13/1995	815	5000		09/13/1994	830	110
01/10/1995	815	700		08/08/1994	815	50
12/12/1994	812	130		07/12/1994	805	3000
11/15/1994	815	50		06/13/1994	826	5000
	Average =	3719			Average =	1162
% Exceedance of 2000/100ml =		38%		% Exceedance of 400/100ml =		29%
		Flow	Fecal	Flow	Load	
		cfs	Count (fcu)	gal/day	fcu/day	
Current May - Oct Load		504	1162	325161290	1.43E+13	
Allowable May - Oct Load		504	200	325161290	2.46E+12	
% Load Reduction May - Oct		481				
Current Nov - April Load		878	3719	566451613	7.98E+13	
Allowable Nov - April Load		878	1000	566451613	2.15E+13	
% Load Reduction Nov - April		272				

APPENDIX B Dischargers in subsegment.

Dischargers to Bayou Plaquemine Brule			
Facility	Permit #	Receiving Water	Discharge Flow
			gallons/day
Union Pacific Products	LA0005444	Bayou Wikoff to Bayou Plaquemine Brule	96,000
Canal Refining - Church Point	LA0006963	Bayou Plaquemine Brule	50,000
City of Church Point POTW	LA00038598	Bayou Plaquemine Brule	800,000
Baker Performance Chemicals	LA0064661	Bayou Plaquemine Brule	100
City of Crowley Water Plant	LA0069833	Bayou Blanc to Bayou Plaquemine Brule	68,000
Wright Enrichment Inc. - Crowley	LA0072184	Bayou Plaquemine Brule	1,000
Plastics, Inc. of Rayne	LA0084841	Bayou Wikoff to Bayou Plaquemine Brule	1,500
Acadian Fine Foods ltd.	LA0085723	Bayou Wikoff to Bayou Plaquemine Brule	74,000
City of Crowley POTW	LA0041254	Bayou Plaquemine Brule	2,500,000
Opelousas Electric Power Plant	LA0036145	Bayou Plaquemine Brule	3,000
Village of Estherwood POTW	LA0064530	Coulee Trief to Bayou Plaquemine Brule	80,000
DePree transport Inc. - Church Point	LA0089036	Bayou Wikoff to Bayou Plaquemine Brule	3,000
Acadiana Treatment - Atwood Acres	LA0074896	Bayou Plaquemine Brule	46,000
North Rayne POTW		Bayou Wikoff to Bayou Plaquemine Brule	20,000
Crowley High School POTW		Bayou Plaquemine Brule	34,000
City of Rayne POTW	LA0039055	Bayou Plaquemine Brule	1,500,000
		total	5,277,000

APPENDIX C Flow calculation methodology.

January 27, 2000

DETERMINATIONS OF AVERAGE STREAMFLOW FOR SELECTED LADEQ WATER QUALITY STATIONS IN LOUISIANA.

Note: *The* "average streamflow" is defined to be the annual average streamflow.

Bayou Des Cannes northeast of Jennings (DEQ # 0308 and 0647) - Based on the runoff for the USGS station on Bayou Des Cannes near Eunice, 2.11 CFS per square mile, and a drainage area for the 308 site of 368.69 square miles, the average streamflow is estimated to be 778 CFS. . The May - October average flow is estimated to be about 73% of the annual average flow; the November - April average flow is estimated to be about 127 % of the annual average flow.

Bayou Nezpique at La. 104 north of Basile (DEQ 005) -- Based on the runoff for the USGS station on Bayou Nezpique near Basile, 1.89 CFS per square mile, and a drainage area for the 005 site of 327.62 square miles, the average streamflow is estimated to be 619 CFS. . The May - October average flow is estimated to be about 47% of the annual average flow**;** the November - April average flow is estimated to be about 153 % of the annual average flow.

Bayou Nezpique at La. 97 near Jennings (DEQ 309) -- Based on the runoff for the USGS station on Bayou Nezpique near Basile, 1.89 CPS per square mile, and a drainage area for the 309 site of 580 square miles, the average streamflow is estimated to be 1,096 CFS. The May - October average flow is estimated to be about 47**%** of the annual average flow-, the November - April average flow is estimated to be about 153 % of the annual average flow.

Bayou Nezpique at boat landing near Jennings (DEQ 651) - Based on the runoff for the USGS station on Bayou Nezpique near Basile, 1.89 CFS per square mile, and a drainage area for the 651 site of 585 square miles, the average streamflow is estimated to be 1, 106 CFS. The May - October average flow is estimated to be about 47**%** of the annual average flow; the November - April average flow is estimated to be about 153 % of the annual average flow.

Bayou Plaquemine Brule at Refinery (DEQ 650) - Based on the runoff for the USGS station on Bayou Des Cannes near Eunice (best available estimator), 2.11 CFS per square mile, and a drainage area for the 650 site of 331.87 square miles, the average streamflow is estimated to be 700 CFS. The May - October average flow is estimated to be about 73% of the annual average flow; the November - April average flow is estimated to be about 127 % of the annual average flow.

DETERMINATIONS OF AVERAGE STREAMFLOW FOR SELECTED LADEQ WATER QUALITY STATIONS IN LOUISIANA PAGE 2.

Bayou Boeuf at mouth (DEQ 668) - Based an the runoff for the USGS station an Bayou Courtableau near Washington, 1.56 CPS per square mile, and a drainage area for the 668 site of 234.33 square miles, the average streamflow is estimated to be 312 CFS. The May - October average flow is estimated to be about 53% of the annual average flow; the November - April average flow is estimated to be about 147% of the annual average flow.

Bayou Teche at Breaux Bridge (DEQ 03 1) -- Based on the adjusted runoff for the USGS station on Bayou Teche at Arnaudville and a subtraction of the estimated average flow for Bayou Fusilier, the estimated average streamflow is 760 CFS. The May - October average flow is estimated to be about 76% of the annual average flow; the November - April average flow is estimated to be about 124 % of the annual average flow.

Bayou Teche at Adeline (DEQ 030) – With the assumption that the average streamflow for the USGS station on Bayou Teche at Keystone Lock and Dam is the same as the average streamflow at Adeline, the estimated average streamflow for Site DEQ 030 is 491 CFS. The May-October average flow is estimated to be about 78% of the annual average flow; the November-April average flow is estimated to be about 122% of the annual average flow.

Vermilion River at Perry (DEQ 001) – Based on DEQ determinations for Vermilion River at Surrey Street in Lafayette using USGS data for the period 94-97, the average flow for the Vermilion River at Perry is about 750 CFS. For May-October, the average flow is estimated to be about 600 CFS; for November- April, the average flow is estimated to be about 900 CFS.